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ABSTRACT

This publication is a guide for the design of student projects in environmental education. A few advantages of problem-focused projects are: easy incorporation into the ongoing curriculum; opportunity for joint student/teacher use of knowledge, information, and skills in action-oriented activities related to local environmental concerns; identifying, weighing, and clarifying values; research and technical reporting skills; and development of divergent and convergent thinking skills. The student project provides a method for student involvement and inquiry-based learning. The five instructional objectives presented are based on the above-mentioned advantages. Under each objective are teaching strategies, specific instructional procedures, and some sample questions to raise. The objectives, strategies, and procedures serve as the basis for process activities and outcomes that can be realized through all problem-solving projects. Three projects that can be utilized and adapted by secondary and college students in their study of communication on environmental issues are outlined. Two of the projects concern environmental impact; the third, environmental research. Each project is sub-divided into objectives, focus, suggested approaches, project design, and evaluation. Appendiced information pertaining to organizations of environmental concern, expanded problems for study, and a bibliography of materials is to be used in conjunction with the projects. (BP)

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Environmental Education Teaching Resources:

Projects for Environmental Problem-Solving

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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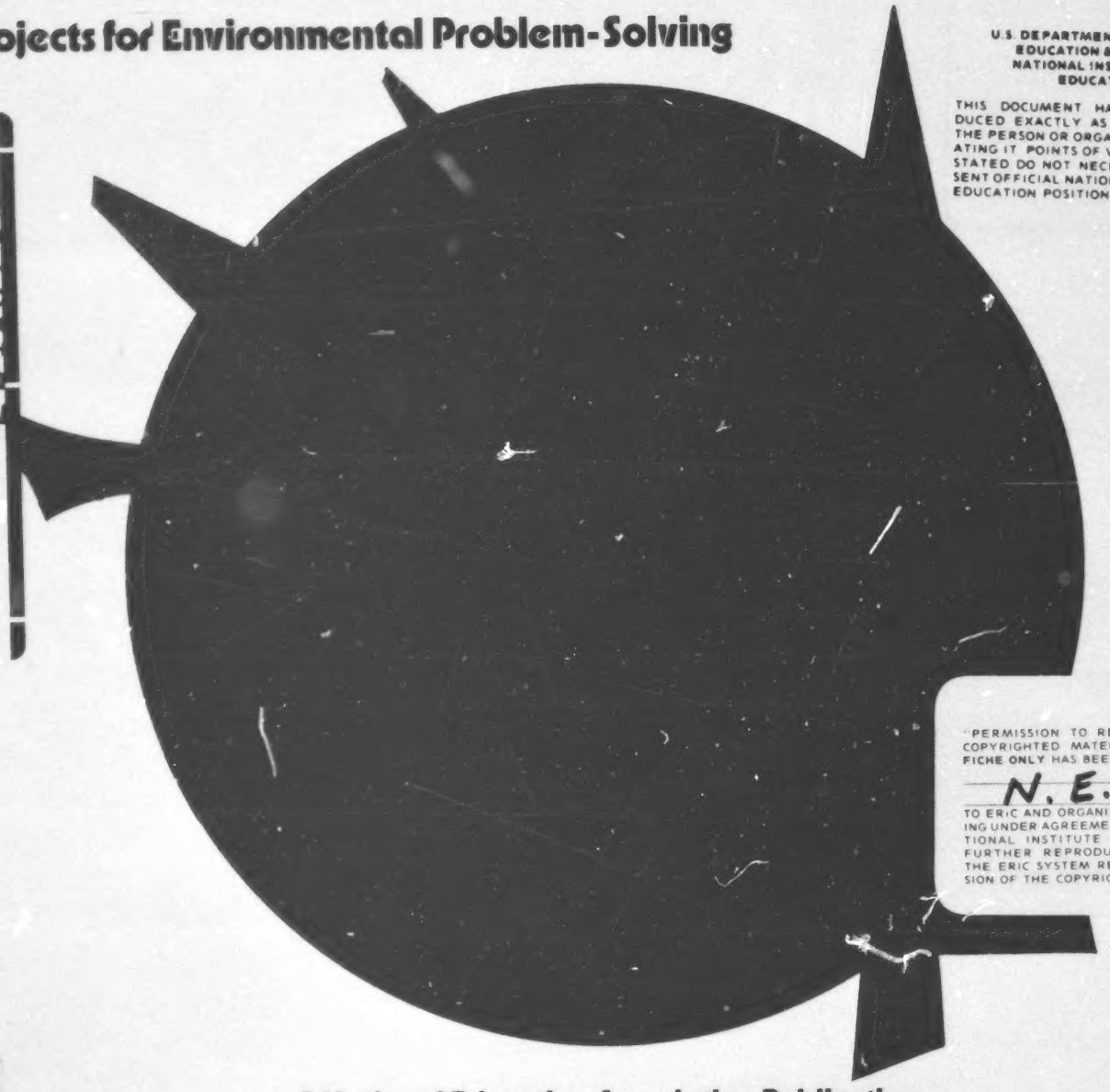

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Environmental Education Teaching Resources:

Projects for Environmental Problem-Solving

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CONTENTS

The Model Environmental Education Program 4

Preface 5

Historical Perspective 6

Advantages of Problem-Focused Projects in Environmental Education 7

Instructional Objectives for Problem-Focused Projects 8

Instructional Objectives, Strategies, and Procedures 8

Problem-Solving Projects 11

Environmental Concerns 11

Evaluation of Environmental Impact 13

Summary 16

Appendix A 19

Appendix B 20

Appendix C 22

Appendix D 23

The Model Environmental Education Program

A model environmental education program is one that helps the individual become (1) aware of the environment and its associated problems; (2) concerned, knowledgeable, and accurately informed about the problems; (3) knowledgeable and informed about the possible future consequences of the problems; (4) engaged in clarifying values and making decisions based on attitudes and beliefs; (5) involved in finding the solutions to environmental problems — alternatives, trade-offs, compromises, and costs; and (6) committed to and involved in some type of constructive action which enhances environmental quality.

Jonathan M. Wert

Preface

Environmental education is the translation of a concern for the environment into a style of teaching, a focusing of issues, and a way of life. It represents an opportunity for the best of curriculum and teaching in three major ways. Environmental education is interdisciplinary in that it recognizes the need for consideration of the interrelationships among the physical, psychological, economic, aesthetic, and social factors in environmental planning and use. It is both cognitive and affective in that personal values and preferences must be included with factual knowledge. It is relevant in that application of environmental education may be made in the day-to-day lives of all learners — from elementary school through continuing-education experiences.

The National Education Association has supported efforts to extend environmental education and has developed teaching resources to assist its members in the development, application, and evaluation of environmental education.[1] The contents of this book were adapted from materials prepared by Jonathan M. Wert. The book is not intended to be an inclusive teaching resource, but rather a guide for the design of student projects. Three action-related projects are outlined, which can be utilized and adapted by secondary and post-secondary students in their study of communication on environmental issues. These projects provide three methods for structuring the collection, analysis, and reporting of information relating to environmental concerns. With some adaptation, portions of the projects could be carried out by students at lower levels.

The materials outline an approach and methodology for using student projects as a way to teach students community problem-solving skills. They are based on the research-action methodology for problem-solving which emphasizes the collection and use of data as a necessary precondition for decision-making.

The student project provides a method for student involvement and inquiry-based learning. Students may be involved individually, in teams, or with groups of adults in collecting information about actual community problems and in seeking solutions that are realistic and attainable.

The book should be viewed as a beginning point for teacher-student planning. It is our hope that it will stimulate interests and activities that will help students understand the complex factors involved in the decision-making that can lead to improving the quality of our lives and our environment.

Historical Perspective

In the late 1950's, a few voices were heard articulating a concern for the deterioration of the environment and the dwindling supply of natural resources. These warnings were first sounded by a small group of scientists and environmental advocates. Gradually, many citizens, professional groups, and national leaders enthusiastically joined in the drive to avert depletion of natural resources and to maintain and improve the quality of our environment.

Teachers also recognized the need for action, and a teaching approach and materials emerged as a recognized specialty of environmental education. The primary aims of this specialty were focused on the mastery of knowledge related to the environment and on the development of skills for identifying and assessing the complex issues to be considered in environmental decision-making.

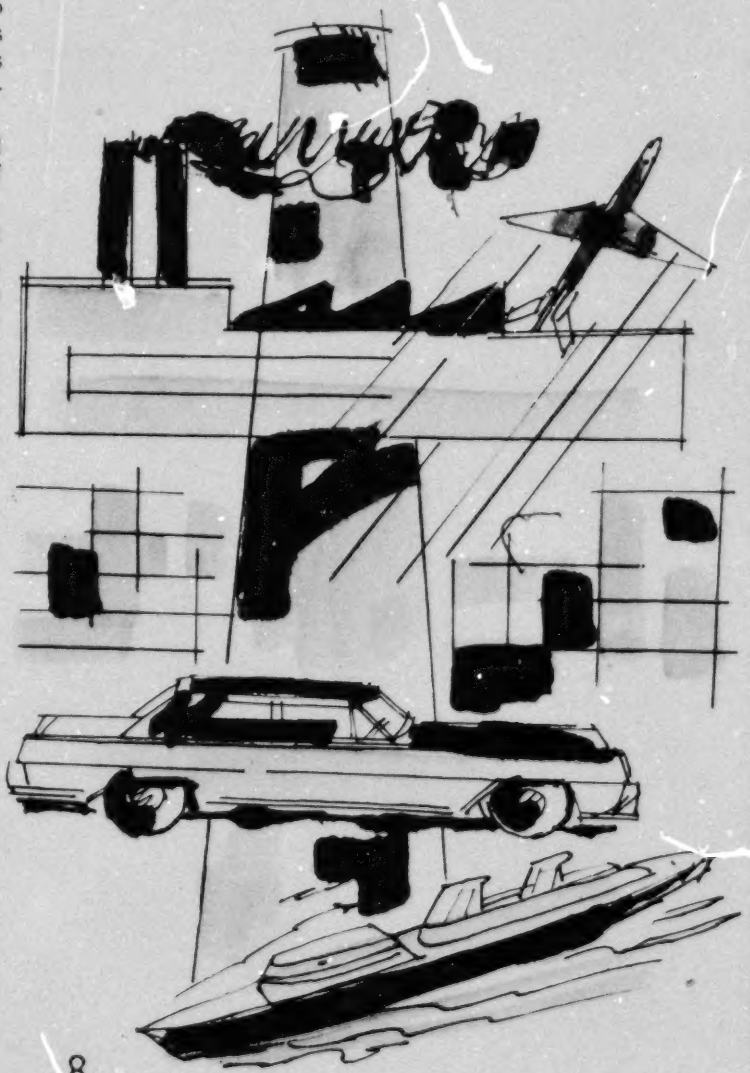
Experience of the past years has demonstrated the diversity of emphases in the formulation of environmental concerns:[2]

- Some emphasize the stability of our planet and its adaptability, rather than its fragility.
- Some emphasize the need for improving the quality of human settlements, rather than the conservation of natural ecosystems.
- Some believe that change will be achieved through individual action and awareness; others by governmental control over business and industry; and still others by an evolution of political structures and/or life-styles.
- Some assert that the primary threat to the environment results from high energy, high profit technology; others see energy as the basic ingredient of improving and maintaining the quality of life.
- Some emphasize the need for greater scientific knowledge and better technology; others in socio-economic morality; and still others in a return to basic values.

The diversity of beliefs regarding the issues, strategies, and desired outcomes remains, and in 1975 we find few practical models and approaches that are available for environmental problem-solving. Although the interest in the environment has produced an ever-increasing body of information regarding our environment and the threats to its continuance, little assistance is being provided for the development of problem-solving skills.

The development of a desirable human environment extends beyond the elimination of pollution, the conservation and management of natural resources, and the control of forces that threaten the quality of life. It also requires that individuals, groups, and our society be involved with the planning and development of surroundings and ways of life that are consistent with their own preferences, values, choices, and responsibilities.

Our relationship with our environment is transactional. We not only exist and function in our environment, but also shape it and are shaped by it. There can be no more important task than to prepare our future generations to learn how our future will be influenced by our environment and to learn how we can influence the world around us.



Advantages of Problem-Focused Projects in Environmental Education

Projects in environmental education serve seven major functions as an instructional strategy.

(1) The problem focus of an environmental education project can be easily incorporated as a part of the ongoing curriculum in content areas such as social studies, health, economics, political science, geography, chemistry, vocational, and industrial training, etc.

(2) Projects afford teachers and students opportunities to participate jointly in using knowledge, information, and skills in action-oriented activities related directly to the problems of their own local environments.

(3) Increased opportunities and motivation for the development of oral and written communication skills among individuals and groups are fostered through cooperative activities in project design and implementation.

(4) Practice in the skills of identifying, weighing, and clarifying values as important elements of the decision-making process is a natural outgrowth of project development.

(5) Research and technical reporting skills which can be used in problem-solving throughout life are fostered during project development efforts.

(6) Project participants are offered experiences in the development of divergent (exploration, documentation, and analysis) and convergent (synthesis, focus, and evaluation) thinking skills.

(7) Time and efforts required to design and implement projects can be tailored to fit the schedules and requirements appropriate to local concerns.

Instructional Objectives for Problem-Focused Projects

Throughout life, problems are encountered. Projects which focus on problem definition and resolution offer a means to help students master the processes of problem resolution. These processes can be applied repeatedly, regardless of the nature or special content of the problem in question. The skills and activities included in addressing a problem in any project are among the most valuable outcomes of instruction and learning.

Some of the instructional objectives and teaching strategies which can be included in any project follow. Of course, the teacher is the best and final judge of the appropriate use, with or without modification, of these suggestions.

Instructional Objectives, Strategies, and Procedures

Objective I: To assist students in developing divergent and convergent thinking skills in problem selection.

Instructional Strategies

(1) To provide information by which students can arrive at consensus in establishing a problem priority and final selection for project focus.

(2) To pose questions which will assist students in examining the requirements for problem definition and investigation.

Instructional Procedures

Step 1: Examine and select five problems from Appendix B (p. 20) which represent critical concerns in your local environment.

Step 2: Present students with a list of five problems which can serve as a possible project theme.

Step 3: Request individual students to rank in order each of the five problems. Number 1 could indicate a problem of highest priority, with 5 indicating the problem of lowest priority.

Step 4: Share class results by listing the five problems on the chalk board or newsprint. Document class rating by recording the number of 1 ratings for each problem. Continue recording ratings until consensus is established as to project focus.

Step 5: Pose questions for individual and/or group exploration.

- Why do you think this problem was selected as a focus for project development?
- Why do you think other problems received lower priority ratings? Record or discuss responses.
- Compare responses and suggest some reasons underlying the basis for decision-making in selecting the priority ratings which were assigned. Conduct class discussion concerning students' reasons for their choices. Guide students in identifying the use of information, facts, opinions, and values as influences of decision-making and priority-setting.

Step 6: Point out the use of establishing consensus as a technique for encouraging individual participation and assisting in resolving group direction.

Objective II: To guide students in developing planning skills for problem/project definition and investigation.

Instructional Strategy

To pose questions which will guide students in identifying project/problem needs through convergent and divergent thinking.

Instructional Procedures

Sample Questions

- What resources will be needed to solve this problem?
  - Information needs
  - Space needs
  - Materials needs
  - Financial needs
  - Human needs
  - Other needs
- What kinds of cooperation will be needed to investigate the problem —
  - From other schools?
  - From other classes?
  - From other institutions?
  - From the community?
  - From local, state or national governmental agencies?
  - From business or industry?

- What information is currently available?
  - Reports
  - Books
  - Periodicals
  - Standards
  - Regulations
  - Laws
- Is information readily available? Where?
  - Libraries
  - Schools
  - Colleges
  - Universities
  - Federal depositories
  - Municipal directories
  - Periodicals
  - Documents
- Can the project be completed within the time available? How? Who will have to perform what tasks? When?

Objective 3: To encourage students in developing skills for evaluating the quality or validity of information they will need in reaching problem resolution.

Instructional Strategy

To pose questions which that will guide students in establishing criteria for making judgments about validity of data.

Instructional Procedures

- How can we document sources of the information we need?
- How can we identify a fact? An assumption? An opinion?
- How does time affect the importance of information — old information compared with new information?
- How can we establish accuracy of information? Credibility? Bias? Representatives of all viewpoints?
- What alternatives can be developed in identifying and evaluating information?
- What sources or strategies can be identified to provide information which can be considered credible?
- What methods can be used for collecting and evaluating information?
- Which methods seem best for our purposes? Why?

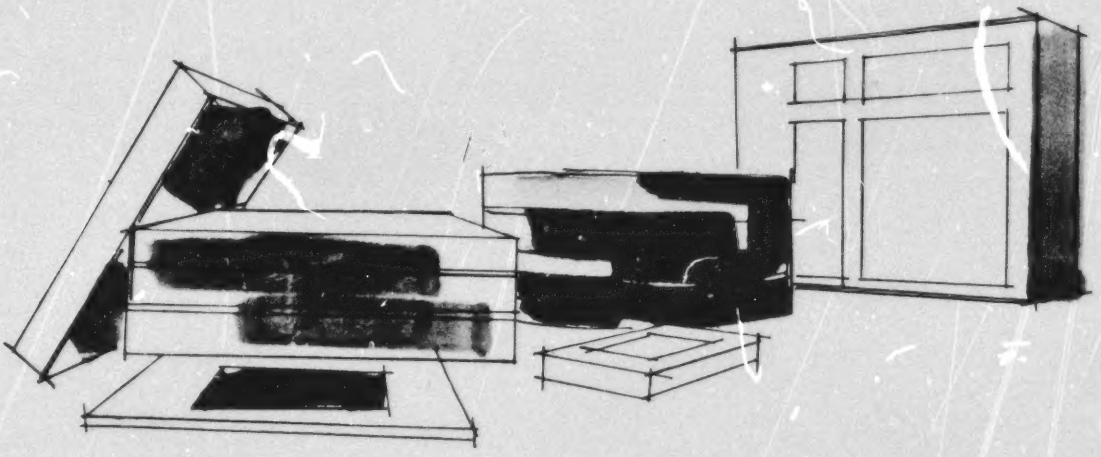
Objective 4: To assist students in analyzing and synthesizing information related to the problem.

Instructional Strategy

To pose questions which will assist students in developing the skills of comparison and in establishing relationships.

Instructional Procedures

- How will information help solve this problem/project?
- How will information be analyzed for:
  - Differences?
  - Similarities?
  - Relationships?
  - Classification?
  - Categorization?
- How will information be synthesized or brought together for problem solution?
  - Insure representatives of different viewpoints
  - Insure accuracy and validity
  - Insurance balance in conclusions



Objective 5: To assist students in using information to insure effective problem solution.

Instructional Strategy

To pose questions which will assist students in determining the forms and outcomes most effective in problem resolution.

Instructional Procedures

- How will project findings best be used by ourselves and others?
  - Written reports
  - Oral presentations
  - Policy statements
  - Action strategies for self and others
  - Action recommendations for self and others
  - Others
- What audiences or people should receive the information?
  - Schools
  - Government agencies
  - Individual persons
  - Organizations
  - Community groups
  - Others
- How will action strategy results be known?
  - Documentation?
  - Monitoring?
  - Follow-up over time?
  - Others

These instructional objectives, strategies, and procedures which have been presented serve as the basis for process activities and outcomes that can be realized through all problem-solving projects.

The following section will focus on three projects which emphasize differing approaches to solving specific problems related to environmental education content.

Combining generalizable process objectives with unique content objectives offers to many teachers and learners additional opportunities to strengthen teaching and learning outcomes. Teachers and students at the local levels are urged to modify, adapt, and use their creative talents to select and utilize those suggestions which seem most appropriate and effective for their needs.

Problem-Solving Projects

Project No. 1 — Identifying and Lessening the Impact of an Environmental Problem in the Community

Objectives

To involve students in —

- identifying an overriding environmental and/or community concern
- conducting a community needs assessment on the nature and extent of the problem
- reporting on cause, status, and remedial action required to deal with the problem
- identifying and assisting constituencies for constructive action and follow-up activities.

Focus

Following is a comprehensive listing of potential environmental and other community concerns to assist students in narrowing the scope of the community project initiated to lessen the impact of an existing problem.

Environmental Concerns[2]

What do you feel are the most urgent environmental concerns in your community? (Please rank the major categories by number in order of priority.)

*Major Categories**

___ Population problems
___ Transportation problems
___ Energy problems
___ Resource depletion
___ Aesthetics
___ Materialism
___ Planning, design, and construction problems
___ Economic-social-cultural problems
___ Knowledge gaps
___ Health hazards
___ Water problems
___ Land use problems
___ Air problems
___ Others (please identify)

_____

_____

_____

_____

*The major categories are further broken down into elements within the categories and may be found in Appendix B, pages 20 and 21.

Approach

Three methods are suggested for using the above checklist to identify the problem to be attacked.

Method No. 1: Utilize existing individual or group knowledge of a pressing community concern to select the category and element(s) about which more information is needed. For example, "solid waste disposal," presented under categories "water problems" and "land use," is also related to other categories — e.g., population, resource depletion, aesthetics, health hazards, etc. Study the relationships between categories. In the report of findings, address as many facets of the situation as necessary for understanding the problem. This method enables the individual or group to determine the priority area of concern.

Method No. 2: Using the material in the checklist, conduct personal interviews of at least 50 people from different age groups and walks of life in the community to determine which concern is considered to be of highest priority within the community. The area of primary concern then becomes the focus of the study. In addition to the personal interviews, telephone interviews may also be used to obtain the desired information.

Method No. 3: This method may be appropriate as a team project. Utilizing the checklist, prepare a questionnaire to be mailed to a representative sample of people from different walks of life in the community. This method may also utilize telephone surveys to obtain the same information either initially or in follow-up to the questionnaire distributed by mail. As in method 2, the community helps select the most pressing problems for study.

Design of Project and Report

Determination of the specific study methodology and report format can best be formulated in consultation — in the case of a student, with a faculty advisor. Following are suggested considerations for inclusion in the project and the report:

1. Description of the nature or scope of the problem (solid waste, energy, air pollution, transportation, etc.)

2. Causes of the problem (lack of legislation and enforcement, lack of understanding and concern, lack of a solution, etc.)
3. Present status of the problem in the community, state, region, and nation (for example, in the area of solid waste disposal, the degree of littering; presence and number of open dumps and sanitary landfills; recycling efforts; burning refuse to generate electricity, etc.)
4. Shared responsibilities for offsetting the problems (individuals including self and/or agencies) — action, e.g., enforcement of legislation, funding of remedial programs at the local level, monitoring, pollution, etc.
5. Impact of the problem on the environment including the effects on plant and animal populations (include a discussion on the amount and type of land lost, transportation problems caused, changes in air and water quality and in wildlife habitat, noise, etc.)
6. Possible solutions to the problem (alternatives, compromises, trade-offs, and estimated cost for each.)
7. Potential actions to help solve or minimize the problem (individuals or groups — clubs, professional organizations, etc. — attending hearings, voting, establishing and enforcing legislation, monitoring, etc.)
8. Estimate of individual (or group) commitment needed to help solve or minimize the problem and strategies likely to be employed (Remember — this is the constructive action part of the project and is, therefore, of prime importance.)
9. Recommendations for action and utilization of the report.

The test of the success of Project Number One lies in its effect upon the problem attacked, modification or elimination of problem-causing community conditions, institution of remedial procedures, and development of machinery for continued monitoring. In the final analysis, the greatest success should manifest itself in the growth of the student with enhanced skills for contributing to community problem-solving.

Project No. 2 — Assessing Impact of a Development Project

Objectives

To involve students in

- implementing and seeking compliance with the National Environmental Policy Act of 1970
- developing investigative research and reporting techniques
- sharpening problem analysis and evaluation skills
- acting to protect the community from environmental damage.

Focus

Following is background information provided for the development of a project in compliance with National Environmental Policy Act (NEPA), signed into law January 1, 1970.

NEPA authorized the establishment of a Council on Environmental Quality (CEQ) in the Executive Office of the President, charged with responsibility to study the condition of the nation's environment, to develop new environmental programs and policies, to coordinate the wide array of federal environmental efforts, to ensure that all federal activities take environmental considerations into account, and to assist the President in assessing environmental problems and in determining ways to solve them.

To ensure that environmental amenities and values are given systematic consideration equal to economic and technical consideration in the federal decision-making process, NEPA requires each federal agency to prepare an environmental impact statement in advance of each action, recommendation, or report on legislation that may significantly affect the quality of the human environment. Such actions may include, for example, new highway construction, harbor dredging or filling, nuclear power plant construction, large-scale aerial pesticide spraying, river channeling, new jet runways, munition disposal, bridge construction, and waste treatment or disposal projects. This project deals with development projects; however, environmental impact statements are often required on other types of actions as well. NEPA applies to *any* federal action, or any project receiving federal funds, e.g., changes in rail rates, adoption of health standards, approval of drug licenses, planned recreational facilities, housing developments, shopping centers, regulations such as hunting on federal lands, use of snowmobiles, establishment of nature centers, etc.

Inasmuch as the life of each individual within the community is affected by planned change, the assessment of environmental impact of development projects becomes an individual responsibility of assisting the government in protecting the environment through identification of impact and assisting in ensuring compliance with the National Environmental Policy Act.

Approach

The method to be used in conducting this project consists of (1) identification of a development project, (2) assessment of agency preplanning, and (3) evaluation of potential impact upon the environment.

The selection process must first determine a definite site in the community or state which is currently being considered for development. Examples of potential sites include a shopping center, subdivision (housing development), dam, nuclear power plant, airport, industry, natural resource preserve, tourist attraction, recreational center, mass transportation system.

Obtain and collect information to begin the assessment of planning to date for the project proposal under study. Ask the following questions and include findings in the report:

1. What needs will the proposed project or activity serve?
2. How and on what basis has the responsible organization studied the problem and made preplanning decisions?
3. What factors were considered in choosing this type of development, facility, or activity?
4. Were other alternatives considered? If so, why were they rejected?
5. Why was this site selected?
6. Were other possible locations considered? If so, why were they rejected?

NOTE:

In assessing how well this basic planning has been done, it is important to be realistic about the choice of alternatives. Usually it is easier to recognize the problems posed by the specific project being studied than to foresee problems or limitations that might arise from a different approach or at a different location. Often people in the area affected by a proposed project simply want it built "someplace else."

In other cases there may be new technological approaches that have drawn attention for their potential advantages, but are not yet sufficiently proven or not yet available at practical cost for the situation under study.

Evaluation of Environmental Impact

The next step is determination of the proposed project's environmental impact. Following are questions that will assist in analyzing and arriving at a finding of impact:

1. Will there be a change in air quality during and/or after construction?
2. Will there be a change in water quality during and/or after construction?
3. Will there be any change in the water table as a result of the project?
4. What process will be used for disposing of excess excavated materials?
5. How will the land structure be changed, e.g., ground cover and contour from grading, channelization, drainage of swamps, changes in natural drainage systems, etc.?
6. Will crop or grazing land be affected by the project?
7. Will the level of noise change during and/or after construction?
8. Will there be any aesthetic (visual) deterioration as a result of the project?
9. Will the project cause any odors?
10. Will any nonrenewable resources or mineral deposits (coal, uranium, etc.) be affected?
11. What changes will occur in recreation lands, wildlife habitats, the diversity and density of animal and plant populations?
12. Will the project interfere with bird migration routes?
13. Will any foreign or domestic animal or plant species be introduced into the project area?
14. Will any rare or endangered species be affected by the project?
15. Will any historic or archaeological features, unique wilderness, or natural areas be affected by the project?

16. Will the project ultimately change the amount of energy entering the earth's atmosphere through a given wave spectrum, e.g., change the ozone layer and ultraviolet light?
17. Will the project result in changes in climate, e.g., weather — temperature, wind patterns, atmospheric oxygen supplies, etc.?
18. How will possible contaminants (radioactive wastes, solid wastes, chemicals, etc.) be transported, stored, and disposed of after construction?
19. Will the functions of the project have the potential of changing the genetic code of animals?
20. What changes in human population density will occur during and/or after construction in the project area?
21. How will education (e.g., school enrollments, programs, physical facilities, etc.) as well as health and social services be affected as a result of the project in terms of potential population increase?
22. How will transportation systems and services in the project area be changed during and/or after construction?
23. Will the project result in the construction of small businesses in the area which could have a significant effect on the environment?
24. What will be the number and types of new jobs available during and after construction?
25. What changes will occur to the overall economic status of the area, e.g., income taxes, cost of electricity, products, services, etc.?
26. What provisions have been made for adequate security, police, fire protection, etc.?
27. What provisions have been made for recreational opportunities for all ages but particularly the young?
28. What provisions have been made to ensure the public protection against natural hazards which could be associated with the project from earthquakes, tornadoes, flooding, sinking or settling of the earth under foundations, etc.?
29. What legislation applies to the project at the national, state, and local levels; which laws are being adhered to or enforced; and will there be a need to change pollution standards or regulations, zoning ordinances, etc.?

Wherever one of these items does raise the possibility of a significant impact, try to determine whether the developer has considered the problem and has made an adequate effort to offset or minimize it. Again, alternatives are examined and their costs compared to their benefits in judging what is a workable way of minimizing each of these impacts.

Design and Report

Determination of the specific study methodology and report format can best be formulated in consultation — in the case of a student, with a faculty advisor. The findings arrived at during the assessment of preplanning and the evaluation of potential impact may be included under three major areas of concern:

1. Overall quality of life
   - A. Changes
     - (1) Beneficial
     - (2) Detrimental
2. Accountability
   - A. Consideration of major effects
     - (1) By developer
     - (2) By approving agency
   - B. Alternative Plans
3. Recommended courses of action
   - A. Reconsideration
     - (1) By developer
     - (2) By approving agency
   - B. Citizen involvement
     - (1) By individuals
     - (2) By community organizations
   - C. Strategy planning
     - (1) Time, place, technique
     - (2) Follow-up

Title II under PL 91-190 created the three-member Council on Environmental Quality and charged the Council to gather, compile, and submit to the President of the United States timely and authoritative information concerning conditions and trends in current and prospective quality of the environment. Since the law covers programs and activities of federal, state, and local governments as well as nongovernmental entities or individuals, each citizen has the legal duty to comply with NEPA regulations. Project Number Two is one avenue of compliance and is an exercise that will assist students in fulfilling their obligations as citizens.

Project No. 3 — Environmental Research

Objectives

To involve students in

- collecting data on the nature, background, and quality of research on new approaches to environmental improvement.
- gaining skills in application and evaluation of research methodology.
- assessing the impact of the research.

Focus

This project is particularly appropriate if the area includes a laboratory, test facility, or pilot project where research and development are under way on some new approach to environmental improvement. This could be a new technique for controlling air or water pollution, experimenting with solar energy, recycling wastes, protecting land or forests, conserving natural resources or using them more efficiently — any area relating to a potential for a better environment.

Approach

The method to be used in conducting this project consists of working closely with the agency or group involved in research and development in the processes of (1) data collection on the nature and background of the problem under study, (2) evaluation of research methodology, and (3) analysis and findings of impact of the research.

Design and Report

Procedural steps can best be determined in consultation — in the case of a student, with a faculty advisor. This project can be conducted by an individual or as a team effort.

Data collection and reporting should include:

1. The full background of the problem this research work is designed to help meet.
2. The nature of approach to the problem, its potential advantages, and possible applications.
3. The present status of development.
4. Any technical obstacles that must be overcome.
5. Projected cost of using this approach, if it does prove successful.
6. A discussion of whether the cost may be an obstacle to acceptance for general use.

Conducting a project on environmental research will serve to develop critical, analytical, research, and evaluation skills which will produce immediate results for research and development agencies and long-term career skills for the student.

Summary

Problems with the conflict between resource utilization and maintenance of environmental quality are numerous. This is not a new phenomenon. As human populations and demand upon world resources increase, so does the number of social, political, and economic problems or concerns. There are no simple solutions to most of these problems. They are very complex, and implementing solutions to one problem often results in the creation of a multitude of other problems.

For example, in an attempt to stop air pollution by closing down an industry, recognition must be given to the by-products of the loss of commodities and jobs. Therefore, it is very important to study the relationships of one problem to another. Economic, social, and political implications must be considered when arriving at solutions. Economically, the solution that goes farthest to solve the problem might not be feasible in terms of available funds or the cost might exceed the benefits. In this case, priorities and alternate solutions should be considered. Finding solutions to social, political, economic and environmental problems begins with individual awareness and action. It will do very little good to point the finger at another until each individual's behavior and life-style have been examined to determine how separate and collective actions change the environment in desirable or undesirable ways.

The ultimate result of the problem solving approach is not the report prepared but the experience gained by seeing firsthand what is involved in finding answers that recognize major public needs. It is important that all individuals become actively involved in making decisions affecting their destiny and well-being.

Footnotes

1. National Education Association. *Environmental Education — An Annotated Bibliography of Selected Materials and Services Available.* Washington, D.C.: the Association, 1974. 24 pp.

   ———. *Energy Choices for Now: Saving, Using, Renewing — An Introduction to Energy in the Environment.* Washington, D.C.: the Association, 1974. 64 pp.

2. Adapted from Ward, Barbara, and Dubos, René. *Only One Earth — The Care and Maintenance of a Small Planet.* New York: W. W. Norton and Co., Inc., 1972. pp. xiv-xv.

Appendix A

Interested and/or Legally Responsible Authorities

Federal

- Appalachian Regional Commission (ARC)
- Corps of Engineers
- Council for Environmental Quality (CEQ)
- Department of Agriculture
  - Forest Service
  - Soil Conservation Service
- Department of Health, Education, and Welfare (HEW)
- Department of Housing and Urban Development (HUD)
- Department of the Interior
- Department of Transportation
- Energy Research and Development Administration (ERDA)
- Environmental Protection Agency (EPA)
- Federal Energy Administration (FEA)
- National Aeronautics and Space Administration (NASA)
- National Science Foundation (NSF)
- Tennessee Valley Authority (TVA)

State

- Departments of agriculture
- Departments of conservation
- Departments of health
- Departments of transportation
- Game and fish commissions
- Planning offices or commissions
- State energy offices
- Development districts
- Watershed associations

Others

- Agricultural Extension Agent
- Building inspection departments (local government)
- Chamber of Commerce
- City attorney
- District attorney
- Environmental Defense Fund, Inc.
- Friends of the Earth
- Izaak Walton League
- League of Women Voters
- Legal Aid Society
- Local air pollution control agencies
- Local health departments
- Local planning commissions
- National Audubon Society
- National Wildlife Federation
- State wildlife federations
- State Environmental Council or Environmental Quality Associaiton
- Tuberculosis and Respiratory Disease Asociation
- Urban League
- Zero Population Growth

19

Appendix B

Expanded Outline of Environmental Problems

Population Problems
___Distribution
___Growth rate
___Rural out-migration
___Drain on nonrenewable resources
___Other

Transportation Problems
___Highway construction
___Lack of adequate mass transit systems
___Traffic congestion
___Other

Energy Problems
___Fuel shortages
___Lack in development of alternate energy resources
___Lack of efficiency in use and production
___Other

Resource Depletion
___Lack of recycling for nonrenewable resources
___Improper management of renewable resources
___Other

Natural Environment
___Endangered animal species
___Endangered plant species
___Loss of natural habitat
___Other

Aesthetics

Distracting:
___Sights
___Sounds
___Smells
___Other

Materialism
___Excessive waste in packaging
___Lack of durable, long-lasting goods
___Status products
___Consumerism (product knowledge)
___Other

Planning, Design, and Construction Problems
___Aesthetically and functionally poor architectural design
___Lack of comprehensive regional planning
___Lack of environmental understanding and concern among planners, designers, and contractors
___Lack of planning to prevent future environmental problems and to solve current problems
___Inadequate and shoddy construction
___Other

Economic-Social-Cultural Problems
___Apathy and lack of leadership in problem-solving
___Failure of society to meet human psychological needs
___Harmful social and work environments
___Lack of adequate housing
___Lack of adequate job opportunities
___Life-styles which are detrimental to environmental quality
___Loss of cultural identity and cultural shock
___Poverty
___Consumer problems (prices)
___Other

Knowledge Gaps
___Lack of programs to find and promote solutions to environmental problems
___Lack of solutions to environmental problems
___Lack of understanding of environmental problems
___Other

Health Hazards
___Air pollution
___Pesticides, herbicides, and toxic metals
___Food additives
___Noise
___Radiation
___Water pollution
___Other

20

Water Problems

___ Contamination of ground and surface waters by chemicals, dyes, etc.
___ Flood control
___ Lack of water use plants
___ Limitation of fresh water supplies
___ Sedimentation
___ Thermal discharges
___ Soft waste disposal
___ Solid waste disposal
___ Agricultural run-off (fertilizers, pesticides, and herbicides)
___ Other

_____
_____
_____

Land Use Problems

___ Erosion
___ Inadequate zoning and planning
___ Loss of parks, open space, wetlands, and natural areas
___ Siting of facilities, e.g., nuclear power plants, power transformers and lines, etc.
___ Loss of agricultural lands due to urbanization and inundation
___ Mining operations
___ Solid waste disposal
___ Visual blight (litter, billboard, etc.)
___ Lack of land ethic
___ Other

_____
_____
_____

Air Problems

Emissions:

_____ Trash burning, furnaces in homes
_____ Industrial and power plants
_____ Automobiles, trucks, buses, airplanes, motor-cycles
_____ Other

_____
_____
_____

21

Appendix C

Bibliography of Environmental Education Material Available Through the American Society for Ecological Education, Inc.

The publications described were prepared by Jonathan Wert, consultant in energy/environment/conservation, while serving as an Environmental Education Specialist for TVA in 1974 and may be purchased at prices indicated from The American Society for Ecological Education, Inc., Publications Department, c/o Governors State University, Park Forest South, IL 60466, (312) 534-5000, ext. 2496.

Booklets

Environmental Education Study Projects for High School Students, 1974. Price: $2.*

Description — This booklet addresses how schools can implement a problem-focused environmental education program in an interdisciplinary manner through independent or team studies. It has been designed to serve as a general guide for the teacher, student, group, and/or club interested in identifying environmental or resource problems at the community level and helping to find solutions to them. A comprehensive listing of suggested environmental concerns for study is provided.

Environmental Education Study Projects for College Students, 1974. Price: $2.*

Description — This booklet addresses how colleges and universities can implement a problem-focused environmental education program in an interdisciplinary manner. It deals with three projects: (1) Identifying and Lessening the Impact of an Environmental Problem in Your Community, (2) Assessing Impact of a Development Project, and (3) Environmental Research. The projects are action-oriented and require written reports which serve as case studies for future reference. A comprehensive listing of suggested environmental concerns for study is provided.

Developing Environmental Study Areas, 1974. Price: $2.*

Description — This booklet has been written primarily for the educator or planner interested in developing environmental study areas, including sites in human-made and natural environments. It provides a comprehensive listing of possible environmental study areas; describes how to establish a committee to plan, implement, and evaluate a program; suggests places to obtain assistance; and contains an outdoor environmental study area inventory and evaluation form, as well as an extensive bibliography of materials for planning school sites and/or outdoor laboratories.

Developing Environmental Education Curriculum Material, 1974. Price: $5.*

Description — This booklet deals briefly with curriculum — developing subject or course material — on environmental education for students. It has been prepared to serve as a general guide for the teacher. It describes a process for developing material, where to go for help in order to follow established state and local educational policies in regard to curriculum development; and contains suggested guidelines for developing environmental education curriculum or enrichment material, a proposed table of contents for developing a curriculum or teaching and resource guide for environmental education, a bibliography of selected sources of material on curriculum planning and development, and a list of over 400 selected sources (titles and addresses) from which to obtain environmental-education instructional material.

Pamphlet

Writing Environmental Education Grant Proposals, 1974. Price: $1.50*

Description — This pamphlet has been written to assist educators, planners, community leaders, etc., in preparing a proposal for environmental education program funding. It is *not* to be used in place of a particular funding agency's guidelines — only to give a basic understanding of what the proposal reviewer generally looks for or expects. The topics covered include: Title Sheet, Required Funding Agency Forms, Table of Contents, Abstract, Rationale, Short- and/or Long-Range Goals, Objectives, Approach — What specifically will be done? When will it be done? How will the work be done? Who is going to do the work? — and Appendices.

**Quantity discounts are available. Entire series (five titles): $12 postpaid.*

Appendix D

Bibliography of Environmental Education Material Available from the National Education Association.

In ordering the following NEA materials, please use the stock numbers that are shown in parenthesis and enclose payment for orders under $6. Mail to: NEA Order Department, The Academic Building, Saw Mill Road, West Haven, CT 06516.

Books, Booklets, and Leaflets

Energy Choices for Now: Saving, Using, Renewing — An Introduction to Energy in the Environment. 1974. 64 pp. $3.50 (1342-5-00)

Description — For intermediate students. Can be easily adapted for secondary students. Includes Student Edition and Teacher's Manual. Classroom poster available.

Environment and Population — A Sourcebook for Teachers. 112 pp. Cloth, $5.25 (0615-1-00); paper, $3.75 (0616-X-00)

Description — Presents concepts and classroom activities for use by junior high and high school teachers of history, sociology, science, health, family life, and contemporary issues.

Environmental Crisis: What You Can Do. 1970. Pkg. of 30 leaflets, $1.50 (0619-4-00)

Description — Contains tips on specific ways to improve the environment and lists further sources of information.

Environmental Education — An Annotated Bibliography of Selected Materials and Services. 1974. 24 pp. $1 (1329-8-00)

Description — For the classroom teacher who is developing environmental education curriculum units.

A Guide to Planning and Conducting Environmental Study Area Workshops. 1972. 64 pp. $2.25 (0617-8-00)

Description — Published in cooperation with the National Park Service. Tells how to develop environmental education programs using resources outside the school. Appendices show sample start-up activities, instructional activities, model workshop designs, and a detailed workshop senario.

Man and His Environment: An Introduction to Using Environmental Study Areas. 1970. 56 pp. $1.75 (0618-6-00)

Description — Published jointly with the American Association for Health, Physical Education, and Recreation. Introduces a new interdisciplinary approach to environmental education at all school levels. Provides practical suggestions for those who want to help students understand the relationship between people and their environment.

Audiovisual Materials

Environmental Crisis: What the Individual Can Do. Color filmstrip with record narration and Leader's Guide. 117 frames. 17 min. $15 (0613-5-00)

Description — Published in cooperation with the Association for Supervision and Curriculum Development, Future Teachers of America, National Council for the Social Studies, and National Science Teachers Association.

Man and His Environment: A New Approach to Environmental Education. Color filmstrip with record narration and Leader's Guide. 91 frames. 14 min. $17 (0614-3-00)

Description — Published jointly with the American Association for Health, Physical Education, and Recreation, in cooperation with the National Park Service.

23